PROPOSED REMEDIAL ACTION PLAN

O&R - Clove and Maple - Haverstraw Former MGP
Operable Unit Number: 01
Haverstraw, Rockland County
Site No. 344049
February 2011

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy proposed by this Proposed Remedial Action Plan (PRAP). The disposal of hazardous wastes at this site, as more fully described in Section 6 of this document, has contaminated various environmental media. The proposed remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all PRAPs. This is an opportunity for public participation in the remedy selection process. The public is encouraged to review the reports and documents, which are available at the following repository:

Haverstraw King's Daughters Library
Rosman Center - 10 West Ramapo Road
Garnerville, NY 10923
Phone: 845-786-3800

A public comment period has been set from: **2/25/2011 to 3/28/2011**

A public meeting is scheduled for the following date: **3/8/2011 at 7:00 PM**
Alternate date in case of severe weather: **3/15/2011 at 7:00 PM**

Public meeting location:

Haverstraw Village Hall, 40 New Main Street, Haverstraw

At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP.

Written comments may also be sent through March 28, 2011 to:

William Ports
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
wfports@gw.dec.state.ny.us

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP based on new information or public comments. Therefore, the public is encouraged to review and comment on the proposed remedy identified herein. Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Orange and Rockland Utilities (O&R) Clove and Maple site is a former manufactured gas plant (MGP) and is located at 120 Maple Avenue in a residential and commercial portion of Haverstraw, Rockland County, New York. The site is approximately 1 acre in size and was operated from 1887 through 1935. The site ceased operation in 1935 after the introduction of natural gas in the area. The site is bounded by two residential properties to the northwest, a residential apartment complex and a former pond area to the northeast, Clove Avenue to the southwest and Maple Avenue to the southeast.

Site Features: The site is currently owned by O&R and was utilized as a natural gas regulator station until 2007 at which time the station was decommissioned. The site is currently vacant and only the piping associated with the former regulator station exists at the site.

Current Zoning/Uses: The site is currently zoned for light industrial uses. The majority of the surrounding area is residential.

Historical Uses: The O&R Clove and Maple site was the location of a former gas manufacturing plant which operated from 1887 through 1935. The plant structures were demolished in the 1960s and the property was subsequently used as a natural gas regulator station. Prior to the MGP operations at the Clove and Maple site, a gas plant was in operation at 93B Maple Avenue. The 93B site (Site No. 344044) is located northwest of the Clove and Maple site on the opposite side of Maple Avenue. The 93B MGP Site and nearby properties were previously investigated and remediated in 2003 and 2005.

Site Geology and Hydrogeology: The site is located at the base of High Tor Mountain and is characterized by moderate relief with the ground surface sloping approximately 25 feet to the north. Site geology consists of four geologic units and they are from top to bottom: 1) fill, with thickness ranging from 5 feet to approximately 15 feet and consist of cobbles, gravel, cinders and coal; 2) alluvium (7 feet to 25 feet thick) consisting of silt, clay including coarse-grained sand and gravel; 3) glacial lacustrine clay, with thickness ranging from 2 feet to about 18 feet and; 4) clay consisting of dense silty clay with thickness ranging from 17 feet to about 36 feet. The on-site and off-site groundwater flows northeasterly towards a former pond area and the Hudson River. The former pond area is located under the apartment complex and its parking lot. This pond area was also part of a former stream channel that emptied into the Hudson River. The depth of groundwater varies throughout the site with typical depths of 5 feet to 8 feet below ground surface.

Operable Units: The site was divided into three operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Operable unit 1 (OU1) is the on-site former MGP area (the O&R property) and drainage swale. OU2 consists of off-site properties including single family residential properties, an apartment complex, a portion of an alleyway, and a portion of Maple Avenue. OU3 consists of sediments in the Hudson River embayment located close to the site.

Operable Unit (OU) Number 01 is the subject of this document.

A Record of Decision has yet to be issued for OU 02, 03.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to restricted-residential use (which allows for commercial use and industrial use) as described in Part 375-1.8(g) is/are being evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

Orange and Rockland Utilities, Inc.

This MGP Site is part of the Orange and Rockland Utilities (O&R) multi-site Consent Order. The Department and O&R entered into Consent Orders in January 8, 1996 (D3-0002-94-12) and September 29, 1998(D3-0001-98-03). These orders were superseded by and Order dated March 11, 1999(D3-0001-99-01). The Orders obligate O&R to implement a full remedial program.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Information

The analytical data collected on this site includes data for:

- air
- groundwater
- soil
- soil vapor

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified for this Operable Unit at this site is/are:

benzene	fluorene
ethylbenzene	naphthalene
toluene	indeno(1,2,3-cd)pyrene
xylene (mixed)	benzo(a)pyrene
acenaphthene	benzo(ghi)perylene
anthracene	dibenz[a,h]anthracene
benzo[k]fluoranthene	phenanthrene
chrysene	pyrene
fluoranthene	lead

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable standards, criteria and guidance for:

- groundwater
- soil

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

On-site soil cover and fence IRM

As a result of the Preliminary Site Assessment investigations in 1997, a small area of surface soil was found to be impacted by coal tar and PAH compounds. Based on this information, several inches of gravel was placed over this location and areas where foot traffic was observed; a fence was installed around the entire site to restrict access; and no trespassing signs were posted.

6.3: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*.

Operable Unit 1 (OU-1) - The site is completely fenced, which restricts public access. However, persons who enter the site could contact contaminants if they were to dig or otherwise disturb the soil located beneath the gravel cover material. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Volatile organic compounds in the groundwater may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Because there is no on-site building, inhalation of site contaminants in indoor air due to soil vapor intrusion does not represent a concern for the site in its current condition. The potential exists for the inhalation of site contaminants due to soil vapor intrusion for any future on-site development and occupancy.

Operable Unit 2 (OU-2) - Contact with contaminated soil or groundwater is unlikely unless people dig below the ground surface. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Sampling indicates soil vapor intrusion is not a concern for buildings in OU-2.

Operable Unit 3 (OU-3) - The potential exists for people to come in contact with contaminants in the shallow river sediments while entering or exiting the river during recreational activities.

6.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

The Fish and Wildlife Resources Impact Analysis (FWRIA) for OU(s) 01, which is/are included in the RI report(s), present(s) a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

The primary contaminants of concern are coal tar that was produced and stored at the MGP. Sampling and analysis of the groundwater revealed contamination with volatile and semi-volatile compounds in both the dissolved and in pure product states which exceed groundwater standards. Concentrations of contaminants found on-site exceed soil cleanup objectives. Test pits and soil borings revealed that coal tar and non-aqueous phase liquid (NAPL) coated soils are found at various depths ranging from 6 to 22 feet below ground surface (bgs). NAPLs are organic substances that are relatively insoluble in water and have a different density than water.

Hudson River sediments near a storm water outfall, which is part of OU3, need further investigation to determine the extent of MGP contamination. Some sediments near this storm water outfall have shown MGP impacts.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

To be selected, the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Exhibit B. Potential remedial alternatives for the Site were identified, screened and evaluated in the FS report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit C. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit D.

7.1: Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed

remedy, notices to the public will be issued describing the differences and reasons for the changes.

7.2: Elements of the Proposed Remedy

The basis for the Department's proposed remedy is set forth at Exhibit E.

The estimated present worth cost to implement the remedy is $8,000,000. The cost to construct the remedy is estimated to be $5,900,000 and the estimated average annual cost is $60,000.

The elements of the proposed remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gas and other emissions;
    - Increasing energy efficiency and minimizing use of non-renewable energy;
    - Conserving and efficiently managing resources and materials;
    - Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
    - Maximizing habitat value and creating habitat when possible;
    - Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
    - Integrating the remedy with the end use where possible and encouraging green and sustainable re-development

2. Excavation and off-site disposal of source material and contaminated soil to depths ranging from approximately 15 feet to 22 feet below ground surface (bgs). The limits of excavation are depicted in Figure 3.

3. Excavation and off-site disposal of existing former MGP structures, debris, piping, and major obstructions. The structures and associated piping will be removed to the extent practical.

4. Excavation and off-site disposal of impacted soil in the drainage swale area located along the northern boundary of the site. The soil will be removed to a depth of approximately 12 feet bgs.

5. Soil excavation will be performed within a temporary structure to control odor, vapor, and dust.

6. Groundwater extracted during construction will be sent off-site for treatment and disposal or treated on-site and discharged in compliance with applicable discharge standards.

7. A site cover will be required to allow for restricted residential use of the site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where the soil cover is required it will be a minimum of two feet of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for restricted residential use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer.

8. Imposition of an institutional control in the form of an environmental easement for the controlled property that will:

    a. require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);

    b. allow the use and development of the controlled property for restricted-residential, commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;

    c. restrict the use of groundwater and/or surface water as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH or County DOH;

    d. prohibit agriculture or vegetable gardens on the controlled property; and

    e. require compliance with the Department approved Site Management Plan.

9. A Site Management Plan is required, which will include the following:

    a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

    Institutional Controls: The Environmental Easement discussed in paragraph 8 above.

    Engineering Controls: The site cover identified in paragraph 7 above.

    This plan includes, but may not be limited to:

        i. Excavation Plan which details the provisions for management of future excavation in areas of remaining contamination;

ii. descriptions of the provisions of the environmental easement including any land use, and/or groundwater use restrictions;

iii. provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;

iv. provisions for the management and inspection of the identified engineering controls;

v. the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls; and

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

i. monitoring of groundwater to assess the performance and effectiveness of the remedy;

ii. a schedule of monitoring and frequency of submittals to the Department; and

iii. monitoring for vapor intrusion for any buildings developed on the site, including provision to take actions to address any potential exposures to soil vapor intrusion.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation (RI) for all environmental media that were evaluated. As described in Section 6.1.2, samples were collected from various environmental media to characterize the nature and extent of contamination.

For each medium, a table summarizes the findings of the investigation for OU 1. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants are arranged into categories; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganics (metals and cyanide). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, if applicable, the restricted-residential use SCGs identified in Section 6.1.1 are also presented.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the OU1 portion of the site which are impacting groundwater and soil.

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source Areas are defined in 6 NYCRR Part 375 (au). Source areas are areas of concern at a site where substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Wastes and source areas were identified at the site, as described below.

Manufactured gas was cooled and purified prior to distribution. Two principal waste materials were produced in this process: coal tar and purifier waste. Coal tar is a reddish brown to black oily liquid by-product which formed as a condensate as the gas cooled. Purifier waste is a mixture of iron filings and wood chips which was used to filter and remove cyanide and sulfur gases from the mix prior to distribution.

Coal tar does not readily dissolve in water. Materials such as this are commonly referred to as non-aqueous phase liquid, or NAPL. The term NAPL and coal tar are used interchangeably in this document. Although most coal tars are slightly denser than water, the difference in density is slight. Consequently, they can either float or sink when in contact with water.

Specific volatile organic compounds (VOCs) of concern are benzene, toluene, ethylbenzene and xylenes. These are referred to collectively as BTEX in this document. Specific semivolatile organic compounds of concern are the polycyclic aromatic hydrocarbons (PAHs):

acenaphthene	*benzo(a)anthracene*	benzo(g,h,i)perylene
acenaphthylene	*benzo(a)pyrene*	*benzo(k)fluoranthene*
anthracene	*benzo(b)fluoranthene*	*chrysene*

dibenzo(a,h)anthracene 2-methylnaphthalene pyrene
fluoranthene naphthalene
fluorene phenanthrene
indeno(1,2,3-cd)pyrene

Total PAH concentrations as referred to in this plan are the sum of the individual PAHs listed above. The italicized PAHs are probable human carcinogens.

Unlike NAPL, purifier waste is a solid waste of oatmeal consistency. Purifier waste has the potential to leach cyanide and create acidic conditions in nearby surface water and/or groundwater. It contains high concentrations of sulfur and cyanide and has a characteristic blue color from complexed ferrocyanides.

Source areas were identified at the site as noted on Figure 2. The coal tar was found at depths ranging from 5 to 22 feet below the ground surface. These areas were found primarily near the locations of the former MGP structures.

The waste/source areas identified in OU1 will be addressed in the remedy selection process.

Groundwater

Groundwater samples were collected from monitoring wells and analyzed for volatile, semivolatile, and metals compounds to assess conditions at OU1. The results indicate that groundwater contamination exceeds the SCGs for volatile and semivolatile compounds. The contamination is found in a similar zone as the subsurface soils above the till layer. The underlying compacted till provides a confining layer which appears to limit the potential vertical migration of contaminants at the site. The surrounding area is served by public water.

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
Benzene	ND - 1600	1	31/94
Ethylbenzene	ND – 1300	5	30/94
Toluene	ND – 2800	5	17/94
Xylenes	ND - 3400	5	30/94
SVOCs			
Acenaphthene	ND – 120	20	18/94
Anthracene	ND - 920	50	2/94
Benzo(a)anthracene	ND – 430	0.002	5/94
Benzo(b)fluoranthene	ND - 240	0.002	4/94
Benzo(k)fluoranthene	ND – 24	0.002	2/94

Table 1 - Groundwater			
Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
Chrysene	ND – 380	0.002	6/94
Fluoranthene	ND -1100	50	12/94
Fluorene	ND - 1100	50	12/94
Naphthalene	ND – 10000	10	31/94
Indeno(1,2,3-cd) pyrene	ND- 29	0.002	2/94

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

Based on the findings of the RI, the groundwater contaminants associated with the operation of the former MGP are volatile organic compounds (VOC) and semi-volatile organic compounds (SVOCs). The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: benzene, toluene, ethylbenzene and xylene (collectively referred to as BTEX); and naphthalene, acenapthene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, and indeno(1,2,3-cd) pyrene which are a subgroup of compounds generally referred to as polycyclic aromatic hydrocarbons (PAHs). Metals were not determined to be contaminants of concern in groundwater. As noted on Figure 2, groundwater contamination is generally located near the former MGP structures located on the OU 1.

Soil

Surface and subsurface soil samples were collected and analyzed for volatile, semivolatile, and metals compounds at the OU1 area during the RI. Shallow soil samples were collected from a depth of 0-6 inches. Subsurface soil samples were collected to depths up to 32 feet below ground surface (bgs) to assess soil contamination impacts. The results indicate that soils at the site exceed the unrestricted SCG for volatile and semi-volatile organics and metals ranging from 8 to 32 feet bgs.

Table 2 - Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted-Residential SCG[c] or Protection of Groundwater SCG[d] (ppm)	Frequency Exceeding Restricted-Residential SCG
VOCs					
Benzene	ND-62	0.06	19/73	0.06 [d]	19/73
Toluene	ND-140	0.7	12/73	0.7	12/73
Ethylbenzene	ND- 65	1.0	17/73	1.0 [d]	17/73
Xylene (mixed)	ND-360	0.26	22/73	1.6 [d]	22/73
SVOCs					

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted-Residential SCG[c] or Protection of Groundwater SCG[d] (ppm)	Frequency Exceeding Restricted-Residential SCG
Acenaphthene	ND-100	20	5/74	98 [d]	5/74
Benzo(a)anthracene	ND-45	1	20/73	1	20/73
Benzo(a)pyrene	ND-30	1	19/73	1	19/73
Benzo(b)fluoranthene	ND-22	1	14/73	1	14/73
Benzo(k)fluoranthene	ND-23	0.8	18/73	3.9	17/73
Chrysene	ND-42	1	19/73	3.9	19/73
Dibenz(a,h)anthracene	ND-43	0.33	12/73	0.33	12/73
Fluoranthene	ND-120	100	1/73	100	1/73
Fluorene	ND-140	30	6/73	100	1/73
Indeno(1,2,3-cd)pyrene	ND-14	0.5	18/73	0.5	18/73
Naphthalene	ND-670	12	17/73	12 [d]	17/73
Phenanthrene	ND-440	100	6/73	100	6/73
Pyrene	ND-170	100	3/73	100	3/73
Metals					
Lead	15.9-726	63	47/71	400	3/71

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Restricted-Residential Use, unless otherwise noted.
d - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Groundwater

The primary soil contaminants are PAHs and lead associated with paint residues on former gas holders from the operation of the former MGP. The area of soil contamination associated with the former MGP site is shown on Figure 2.

PAHs and metals concentrations in surface soil samples exceeded soil cleanup objectives (SCOs) in multiple locations of OU1. Background soil concentrations for metals were found to also exceed SCOs. Surface soil contamination detected during the RI will be addressed in the proposed remedy to be consistent with the next intended use of the site.

Based on the findings of the Remedial Investigation, the past disposal of hazardous waste has resulted in the contamination of surface and subsurface soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process, are BTEX, PAHs and lead.

Soil Vapor

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of soil vapor. At OU1, no buildings were present in impacted areas, structure vapor intrusion evaluation and sampling could not be conducted on-site; however soil vapor was evaluated at representative locations along the property line and around the perimeter of the Head Start building which is adjacent to the site. The soil vapor investigation confirmed that no MGP-related vapor impacts have been identified extending onto the Head Start property. Soil vapor and indoor air sampling were performed on the properties comprising OU2 to determine whether actions are

needed to address exposure related to soil vapor intrusion. It was concluded that there was no need for remedial actions at the Apartment Complex buildings or the nearby residences on Maple Avenue or West Street based on the sampling analysis.

Based on the concentration detected, and in comparison with the NYSDOH Soil Vapor Intrusion Guidance, no site-related soil vapor contamination of concern was identified during the RI. However, the remedy will address any future site development and the potential for on-site soil vapor intrusion.

Exhibit B

SUMMARY OF THE REMEDIATION OBJECTIVES

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial objectives for the OU1 portion of the site are:

Groundwater

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.
- Restore ground water aquifer to meet ambient groundwater quality criteria, to the extent practicable.
- Remove the source of groundwater contamination.

Soil

- Prevent ingestion/direct contact with contaminated soil exceeding applicable SCOs.
- Prevent inhalation of or exposure from contaminants, including dust, from the soil
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

- Prevent impacts to public health resulting from the potential for soil vapor intrusion into future buildings at a site.

Exhibit C

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Exhibit B) to address the contaminated media identified at OU 1 for the site as described in Exhibit A:

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of a portion of the site completed by IRM(s) described in Section 6.2. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Alternative 2: Site Management

This alternative recognizes the remediation of a portion of the site completed by the IRM(s) described in Section 6.2. Institutional and engineering controls are necessary to continue the effectiveness of the IRM. This alternative maintains engineering controls (fence and gravel cover) which were part of the IRM and includes institutional controls, in the form of an environmental easement and site management plan (to restrict the use of site groundwater and land use restriction to present use, etc), necessary to protect public health and the environment from contamination remaining at the site.

Present Worth:.....*$530,000*
Capital Cost:.....*$70,000*
Annual Costs:.....*$30,000*

Alternative 3: Soil Removal to Commercial SCOs and Natural Attenuation of Groundwater

This alternative would include demolition and off-site disposal of the concrete holder pad; excavation and removal of approximately 11,800 cubic yards of MGP-impacted subsurface soils exceeding the commercial use soil cleanup objectives (SCOs) to a depth up to 15 feet bgs and MGP source material to a depth of approximately 22 feet bgs; removal of approximately 870 cubic yards of impacted shallow soil to a depth of one foot below ground surface; placement of a one foot soil cover with clean material from an off-site location. A demarcation layer will be placed at the bottom of excavation. Also this remedy will allow for post-remedial natural attenuation and, if determined necessary, in-situ groundwater treatment. An environmental easement and site management plan consistent with Alternative 2 will be established as part of the remedy. The groundwater will be monitored to determine if a downward trend is observed. The in-situ groundwater treatment will be a contingency action to address elevated groundwater contaminant concentrations if needed. In-situ oxygenation technology was used as a basis for the cost estimate.

Present Worth:.....*$6,700,000*
Capital Cost:.....*$4,900,000*
Annual Costs:.....*$60,000*

Alternative 4: Soil Removal to Restricted-Residential SCOs and Natural Attenuation of Groundwater

This alternative would include demolition and off-site disposal of the concrete holder pad; excavation and off-site disposal of approximately 15,000 cubic yards of MGP-impacted subsurface soils exceeding the restricted-residential SCOs to a depth up to 15 feet bgs and MGP source material to a depth of approximately 22 feet bgs as depicted in Figure 3; removal of approximately 1,300 cubic yards of shallow soil to a depth of two feet; placement of a two foot soil cover over a demarcation layer with clean material from an off-site location; post-remedial natural attenuation that will include in-situ groundwater treatment, if determined necessary; establishment of an environmental easement and site management plan consistent with Alternative 2. The groundwater will be monitored to determine if a downward trend is observed. The in-situ groundwater treatment is a contingency action to address elevated groundwater contaminant concentrations if needed. In-situ oxygenation technology was used as a basis for the cost estimate.

Present Worth:.....*$8,000,000*
Capital Cost:.....*$5,900,000*
Annual Costs:.....*$60,000*

Alternative 5: Restoration to Unrestricted Conditions

This alternative achieves all of the SCGs discussed in Section 6.1.1 for PRAPs and Exhibit A and soil meets the unrestricted SCOs listed in Part 375-6.8 (a). This alternative would include: excavation and off-site disposal of all waste and soil contamination above the unrestricted SCOs. The remedy will not rely on engineering or institutional controls to prevent future exposure. There would be no Site Management, no restrictions, and no periodic review. This remedy will have no annual cost, only the capital cost.

Capital Cost:.....*$11,300,000*

Exhibit D

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
No Action	0	0	0
Alternative 2	70,000	30,000	530,000
Alternative 3	4,900,000	60,000[1]	6,700,000
Alternative 4	5,900,000	60,000[1]	8,000,000
Alternative 5	11,300,000	0	11,300,000

1-The Annual Costs for Alternative 3 and 4 include groundwater treatment for 10 years

Exhibit E

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 4 for OU1, Soil Removal to Restricted-Residential SCOs and Natural Attenuation of Groundwater as the remedy for this site. The elements of this remedy are described in Section 7.2. The proposed remedy is depicted in Figure 3.

Basis for Selection

The proposed remedy for OU1 is based on the results of the RI and the evaluation of alternatives.

Alternative 4 is being proposed for OU1 because, as described below, it satisfies the threshold criteria and provides the best balance of the balancing criterion described in Section7.1. It would achieve the remediation goals for the site by removing the contaminated soils from surface and subsurface locations. This will achieve the Restricted-Residential, Restricted Use Soil Cleanup Objectives in 6 NYCRR375-6.8(b). Alternative 4 will address the contaminated soil from the former plant site, which is the most significant threat to public health and the environment, and will create the conditions necessary to restore groundwater quality to the extent practicable. This alternative also includes a contingency action to address groundwater contamination at OU1 if downward trends in the groundwater are not observed following the removal of contaminated soil. Alternative 4 is an effective restoration of the site which allows future use.

Alternative 1 (No Further Action) does not provide protection to public health and the environment with the existing conditions and will not meet the SCGs nor satisfy the RAOs. Alternative 2 (Site Management through Institutional and Engineering Controls) will not meet the SCGs and will not satisfy RAOs. Alternatives 1 and 2 will not be evaluated further. Alternative 5, by removing all soil contaminated above the unrestricted soil cleanup objectives, would be the most protective of the alternatives. Alternatives 3 and 4 will comply with these criteria but to a lesser degree or with lower certainty. Because Alternatives 3, 4, and 5 satisfy the threshold criteria, the remaining criteria are particularly important in selecting a final remedy for the site.

Alternatives 3, 4 and 5 will all have short-term impacts to the community and workers which could be controlled. The time needed to achieve the remedial goals will be longest for Alternative 3 and shortest for Alternative 5 due to the increasing amount of contaminated soil removed. The greater the removal of contaminated soil, the more quickly the groundwater quality will improve. For Alternatives 3, 4, and 5, the short-term impacts increase with the greater potential for short-term impacts occurring with Alternative 5 because of the greater soil volume removal.

Long-term effectiveness is best accomplished by those alternatives involving excavation of the contaminated overburden soils (Alternatives 3, 4 and 5). Alternative 5 would achieve the greatest long-term effectiveness because it would remove the greatest amount of contaminated soil above SCGs. Alternative 4 would result in the removal of a greater amount of contaminated soil at the site compared to Alternative 3. However, both alternatives will still require an environmental easement and long-term monitoring since residual impacted materials will be left in place. Alternative 4 addresses the source of contamination to the groundwater to a greater extent than Alternative 3 because more impacted material will be removed under

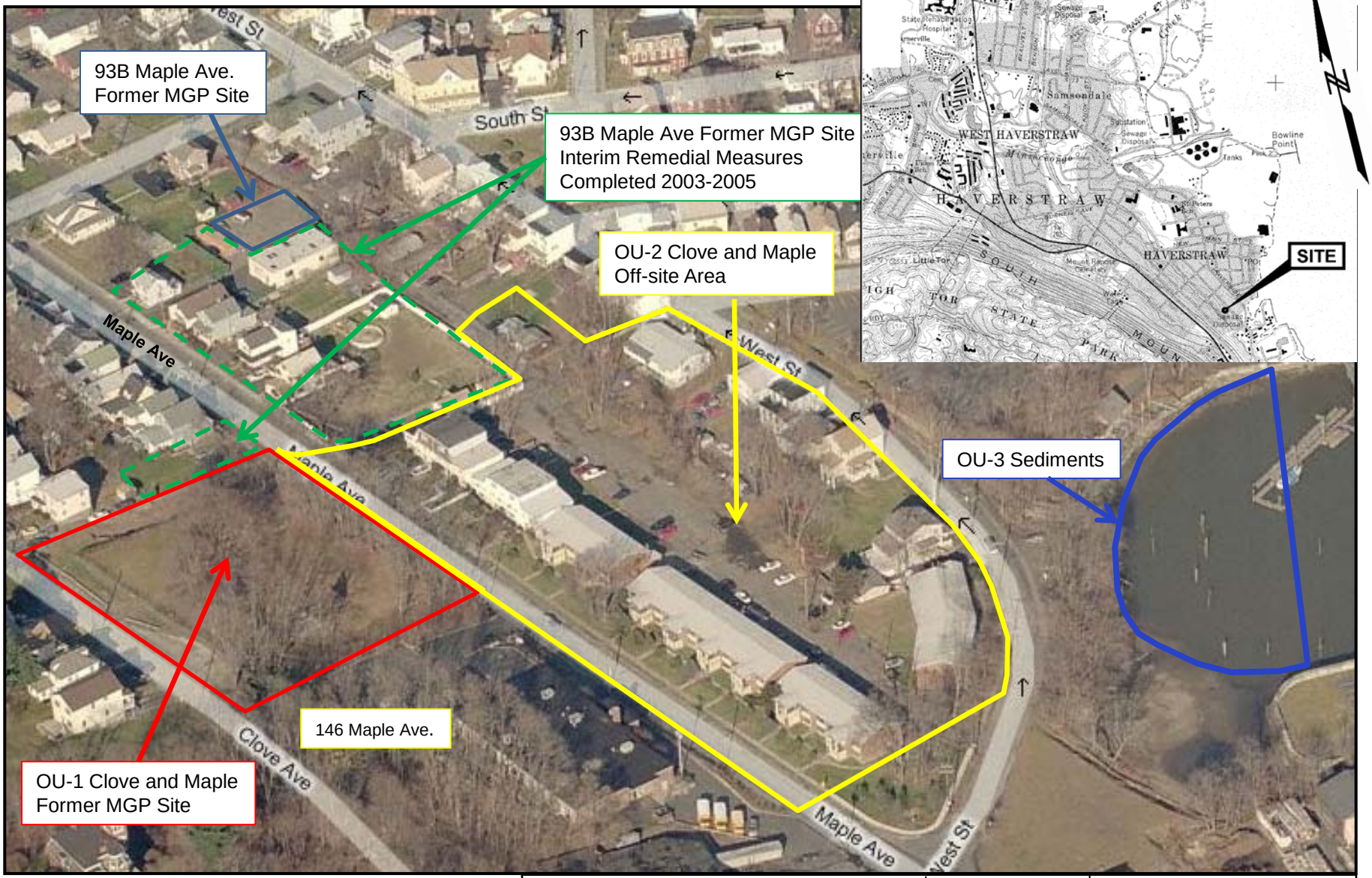
Alternative 4. By removing more impacted material, Alternative 4 will allow much quicker restoration of groundwater to ambient groundwater standard.

Alternatives 3, 4 and 5 each involves excavation and off-site disposal, reduces the toxicity, mobility and volume of on-site waste by transferring the material to an approved off-site location. Alternatives 3, 4, and 5 are favorable in that they are readily implementable. The implementability would become more difficult with increasing volumes of soil being removed for Alternatives 3, 4 and 5. Alternative 3 would be the most implementable soil removal alternatives, followed by Alternative 4 and then Alternative 5. Alternative 5 would involve a very large portion of the project area and would pose severe space limitations, obstructions, water management, and other logistical issues associated with the increased depth and amount of soil removal. Alternative 5 will result in increased level of noise and heavy truck traffic to the community. Although this alternative will result in greater excavation of a greater volume of MGP impacted soil, it will result in greater short-term adverse impacts on nearby residents during construction, without providing a substantial benefit for the protection of human health and the environment.

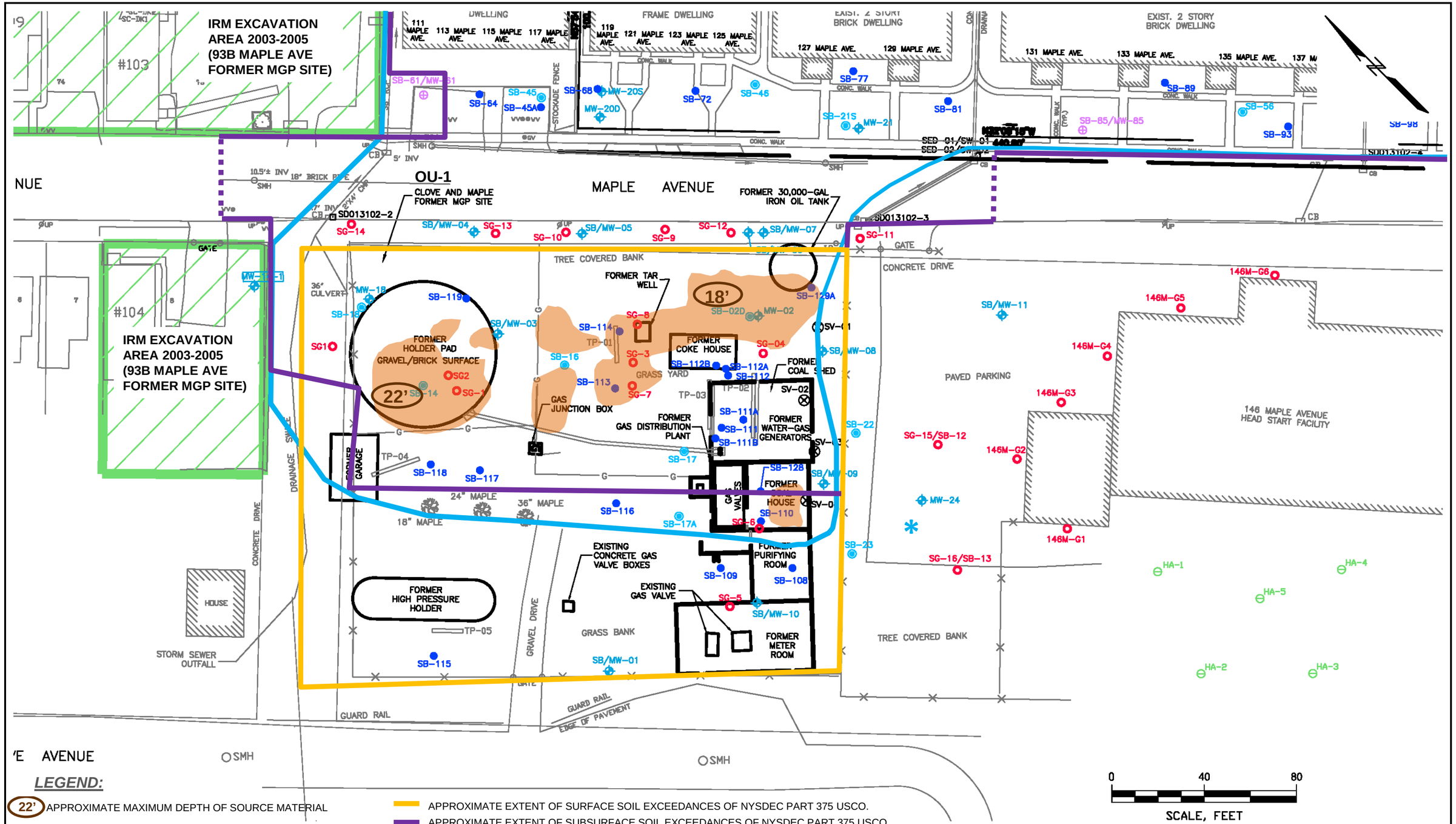
The costs of the alternatives vary significantly. With the large volumes of soil to be handled, Alternatives 3, 4, and 5 (excavation and off-site disposal) will have higher present worth costs. The present worth costs of Alternatives 3, 4 and 5 increase proportionally with the increase in volume of soils being excavated with the capital cost for Alternative 5 being the highest. The incremental cost of over $3 million and significantly increased community disruption associated with Alternative 5 over Alternative 4 are not justified by the marginal increase in protection. Alternative 4 will provide higher level of protection compared to Alternative 3 due to the increased level of removal. Alternative 4 is very favorable because it will achieve cost effective soil cleanup levels and will allow future re-use of the site.

Since the anticipated use of the site is restricted-residential or commercial, Alternative 3 will be less desirable because greater amount of contaminated soil will remain on the property compared to Alternative 4. Residual contamination that will be left behind under Alternative 4 will be controllable with implementation of an environmental easement to restrict the use and groundwater as a source of potable water and will include monitored natural attenuation of groundwater and in-situ groundwater treatment, if needed.

On the basis of the above evaluations, Alternative 4 offers the most balanced and cost effective remedy.



CLOVE AND MAPLE FORMER MGP SITE HAVERSTRAW, NEW YORK		**OU-1 AND OU-2 LOCATION AERIAL PHOTOGRAPH**
ORANGE AND ROCKLAND UTILITIES, INC.		**February 2011** **Figure 1**



LEGEND:

- 22' — APPROXIMATE MAXIMUM DEPTH OF SOURCE MATERIAL
- APPROXIMATE EXTENT OF SOURCE MATERIAL FROM EVS 3D MODEL
- APPROXIMATE EXTENT OF GROUNDWATER EXCEEDANCES OF NYSDEC AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES.
- * MW-24 HAD NO EXCEEDANCES EXCEPT ONE PAH, CHRYSENE, AT 0.5 mg/LJ (ESTIMATED VALUE).
- APPROXIMATE EXTENT OF SURFACE SOIL EXCEEDANCES OF NYSDEC PART 375 USCO.
- APPROXIMATE EXTENT OF SUBSURFACE SOIL EXCEEDANCES OF NYSDEC PART 375 USCO.
- EXTENT COULD NOT BE CONFIRMED DUE TO PROPERTY ACCESS RESTRICTIONS.
- APPROXIMATE LIMIT OF IRM ACTIONS COMPLETED 2003-2005.

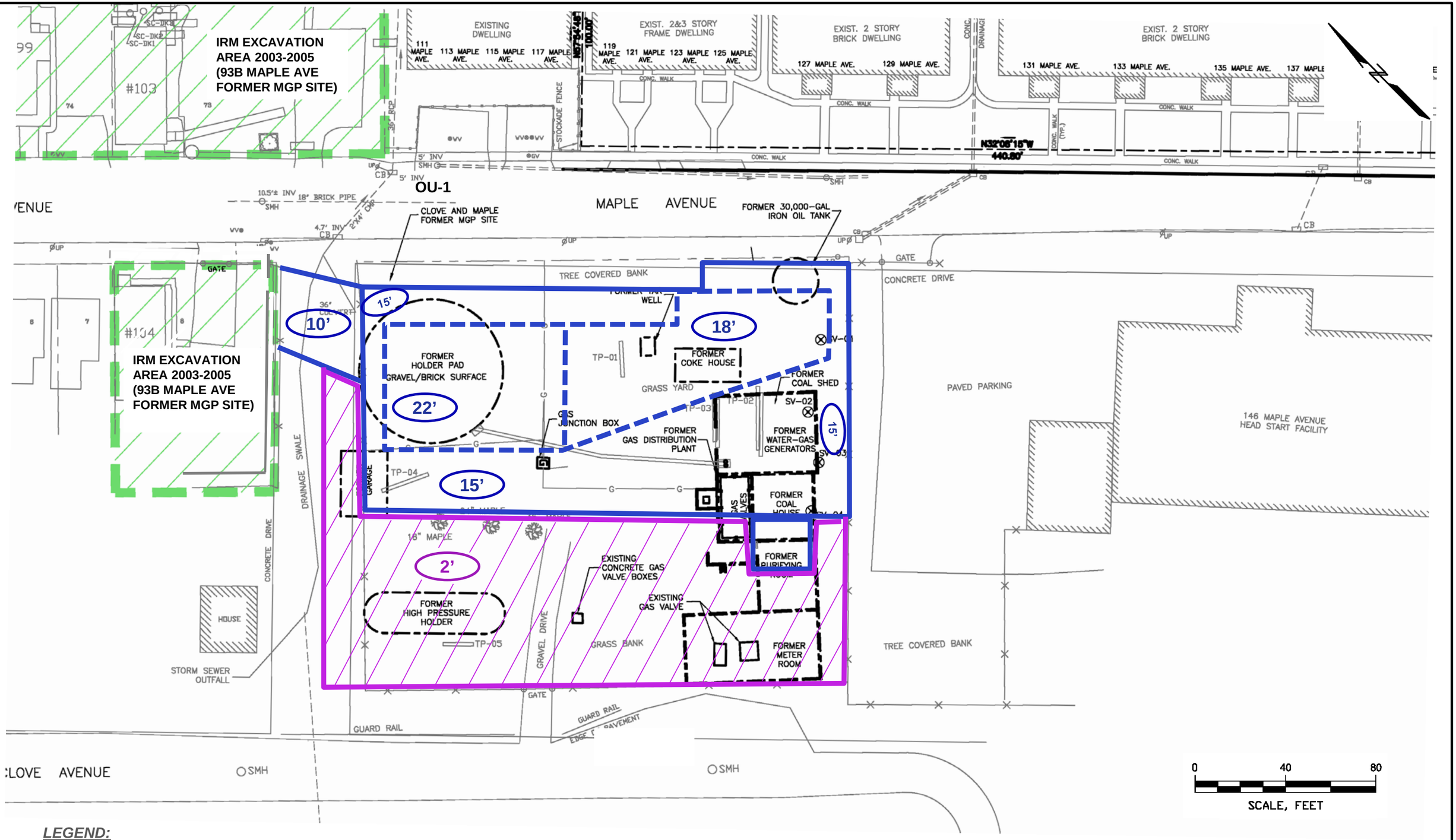
CLOVE AND MAPLE FORMER MGP SITE
HAVERSTRAW, NEW YORK

ORANGE AND ROCKLAND UTILITIES, INC.

OU-1 – LOCATION OF SOURCE MATERIAL

February 2011 — Figure 2

I:\GEI\ORANGE & ROCKLAND\HAVERSTRAW\RIR\ OU1 AND OU2 F-Plate 2-Site Layout 1-28-09.dwg \Oct 22, 2009



LEGEND:

15' APPROXIMATE DEPTH OF EXCAVATION

APPROXIMATE LIMITS OF EXCAVATION FOR PART 375 RESIDENTIAL CLEANUP (ALTERNATIVE 4) AND PLACEMENT OF CLEAN SOIL

APPROXIMATE LIMITS OF REMOVAL OF SURFACE SOIL AND PLACEMENT OF CLEAN SOIL: 2 FEET FOR ALTERNATIVE 4

CLOVE AND MAPLE FORMER MGP SITE HAVERSTRAW, NEW YORK		**OU-1 ALTERNATIVE 4**
ORANGE AND ROCKLAND UTILITIES, INC.		**February 2011** **Figure 3**